RAYTHEON COMPANY
Submarine Signal Division
P. O. BOX 360
PORTSMOUTH, RHODE ISLAND 02871

AIR MAIL

Mr. Theodore H. Nelson
T. Nelson, Sys. Consul.
P. O. Box 1546
Poughkeepsie, N.Y. 12603

RAYTHEON COMPANY
SUBMARINE SIGNAL DIVISION

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October 4, 1968

Mr. Theodore H. Nelson
T. Nelson, Sys. Consul.
P. O. Box 1546
Poughkeepsie, New York

Dear Mr. Nelson:

The need within the information display area for versatile, high performance line-scan recording equipment capable of handling a large quantity of data for spectrum analyzer displays, computer printouts, or any variety of applications has led Raytheon to introduce a line of precision hard-copy recorders. We suggest that you take a close look at the Raytheon Model PER-196B Precision Electrographic Recorder for the highest degree of operational flexibility, accuracy, stability, and repeatability. A unique variety of available options allows the Raytheon Model PER-196B to satisfy any of your recording applications. Or perhaps, if your needs are to analyze stratigraphic profiles in real time in a continuous or start/stop operation, the Raytheon Model PSR-1910B Precision Seismic Recorder with a selection of ten scan speeds was designed for you.

These variable density recorders with high resolution and black-to-white dynamic range, including a full grey scale, provide you with clear, well-defined records. The dry recording paper has excellent geometric stability, unlimited storage life, needs no developing and is not sensitive to light.

The recorder delivery is from stock to sixty (60) days and prices are from $9,180 for the PER-196B to $13,636 for the PSR-1910B. Prices are F.O.B. Portsmouth, Rhode Island.

We appreciate your evaluation of the information on the enclosed data sheets and will look forward to hearing from you. If you have need for further information, please contact us at (AC401) 847-8000, X-2422, or write to Raytheon Company, P. O. Box 360, Portsmouth, Rhode Island, 02871.

Sincerely,

HMK

Howard M. King
Marketing
Ocean Systems and Equipment

HMK/lan
Enclosures

RAYTHEON

PRECISION ELECTROGRAPHIC RECORDER

Model PER-196B

PRODUCT DATA

Adaptable to your need . . .

- Computer Printout
- Seismic Profiling
- Facsimile Weathermapping
- Bottom Profiling
- Sonar Recording
- Spectrum Analyzer Display
- Radar Recording

Courtesy of Geotech

Record your requirements with accuracy, stability, and repeatability on the Raytheon Model PER-196B Electrographic Recorder.

- **Dimensionally stable, dry electrosensitive paper**
- **Reliable operation**
- **Black to white recording range of 23 dB**
- **Versatile signal processing controls gain, threshold and contrast**
- **Adaptability through a wide range of options**

PRECISION ELECTROGRAPHIC RECORDER, PER-196B

CHART DISPLAY

Dry electrosensitive paper in roll form 19⅛ inches wide by 350 feet long. Active scan length is 18.85 inches. Recording ranges from near white to black with full intermediate grey scale. Scan direction is from right to left, paper advance is from top to bottom.
See Option G (Left/Right Scan).

SCAN SPEEDS

8 secs/scan, 4 secs/scan, 2 secs/scan
1 sec/scan, ½ sec/scan, ¼ sec/scan
See Option E (15/16 Motor Pinion).

PRINT DENSITY

The paper feed gear set supplied provides for a writing density of 81 lines per inch.
See Option A (Paper Feed Gear Sets).
See Option H (Chart Feed Clutch).

CALIBRATION LINES

8 sec. scale . . . 20 divisions, 2/5 sec. per division
4 sec. scale . . . 20 divisions, 1/5 sec. per division
2 sec. scale . . . 20 divisions, 1/10 sec. per division
1 sec. scale . . . 20 divisions, 1/20 sec. per division
1/2 sec. scale . . . 20 divisions, 1/40 sec. per division
1/4 sec. scale . . . 20 divisions, 1/80 sec. per division

INPUT SIGNAL DATA

Input Impedance . . . 5000 ohms

Freq. Response .	DC – 20 kHz and 2 – 200 kHz ± 2 dB	
Black Ref. Level .	± 1 Volt DC	0.5 Volt RMS

MOTOR DRIVE

External motor drive signal required.
Frequency . . . 60Hz square wave.
Amplitude . . . 5 volts pp min, AC coupled
Input impedance . . . 2200 ohms
5 watts AC output available at 250 volts pp square wave at motor drive frequency.
See Option C (Precision Oscillator).

PULSE OUTPUTS

Differentiated edge pulse at "zero" position, amplitude ≧ + 6 volts peak, rise time ≦ 2 microseconds, source impedance ≦ 500 ohms. Pulse width ≧ 10 micro seconds.
See Option F (Timing Pulse).

PRIMARY CONTROLS

1. Scale Selector – selects any one of six scan speeds
2. Gain – sets black level
3. Event Mark – push to mark
4. Power – ON/OFF
5. Operate/Standby Switch
6. Headphone Jack – monitor of audible input signal
7. Calibration Lines – ON/OFF

SECONDARY CONTROLS

1. Paper Take-Up Tension Control – allows for past record review while in operation
2. Rapid Chart Advance – electrical or mechanical
3. Sweep Phase Control – phases sweep to external time base
4. Chart Illumination – brightness level set for chart lighting
5. Contrast – varies dynamic range of PER to compensate for varying signal to noise ratios
6. Threshold – eliminates unwanted background noise

POWER REQUIREMENTS

95 to 130 vac, single phase, 57 to 63Hz, power consumption less than 300 watts (6 indicator fuses provide AC protection).

SIZE AND WEIGHT

Width . . . 34½ inches, height . . . 11¾ inches, depth . . . 28 inches. Weight . . . 180 pounds. Shipping weight . . . approximately 245 pounds.

AVAILABLE OPTIONS

A. Paper Feed Gear Sets – matched gear sets may be used for individual selection of 150, 123, 99, 81, 60, 49, 46, 40 and 36 lines per inch ±2%.

B. Double Speed Paper Feed Gear Sets – matched gears may be installed to provide Option A with a selection of 75, 62, 50, 41, 30, 24, 20 or 18 lines per inch ±2%.

C. Precision Oscillator – an oscillator may be installed to provide the signal for motor drive at 60Hz ±2 ppm over operating range of temperature and 1 ppm per 5°C per week.

D. Elapsed Time Meter – a meter may be mounted under the primary control panel to show operating time up to 9999.9 hours.

E. 15/16 Motor Pinion – a motor pinion may be installed to provide scanning speeds as follows:
7½ secs./scan, 3¾ secs./scan, 1⅞ secs./scan, 1⅛ sec./scan, 1⅛₂ sec./scan, 1⅛₄ sec./scan.

F. Timing Pulse – a pulse generator may be installed to provide a differentiated pulse at 0, ¼, ½ and ¾ scan. Amplitude ≧ +6 volts peak, rise time ≦ 2 micro seconds, source impedance ≦ 500 ohms.
This option in lieu of calibration lines.

G. Left/Right Scan – a reverse scan mechanism may be installed to provide a left to right scan. The paper advance remains top to bottom.

H. Chart Feed Clutch – a switch controlled clutch mechanism and gears may be installed to provide for the selection of any two writing densities.
See Options A or B.

I. Gear Box – one of the optional gear boxes may be installed at the time of assembly to provide scan speeds as follows:
(a) 10 secs./scan, 5 secs./scan, 2 secs./scan, 1 sec./scan, ½ sec./scan, ¼ sec./scan.
(b) 20 secs./scan, 10 secs./scan, 2 secs./scan, 1 sec./scan, ½ sec./scan, ¼ sec./scan.

J. Seismic Preamplifier – an amplifier and selector switch may be installed to provide frequency response of DC to 5 kHz with a sensitivity of ±.05 V to ±1.0 VDC in 10 dB steps.

K. Calibration Line Interrupt – a program timer assembly may be provided to interrupt the calibration lines for approximately 10 seconds every 5 minutes.

L. Metric Calibration – a calibration drum and scale may be supplied to provide for measurement in meters rather than fathoms.

M. Facsimile Demodulator – a self contained facsimile demodulator may be installed to provide for display of off air weather information. Manual synchronism is employed.

Raytheon Company reserves the right to make changes to specifications and any other data without notice.

RAYTHEON COMPANY
SUBMARINE SIGNAL DIVISION
RAYTHEON

OSE-106B

OCEAN SYSTEMS AND EQUIPMENT, BOX 360, PORTSMOUTH, RHODE ISLAND, TEL. 401-847-8000.

RAYTHEON

PRECISION FATHOMETER® RECORDER

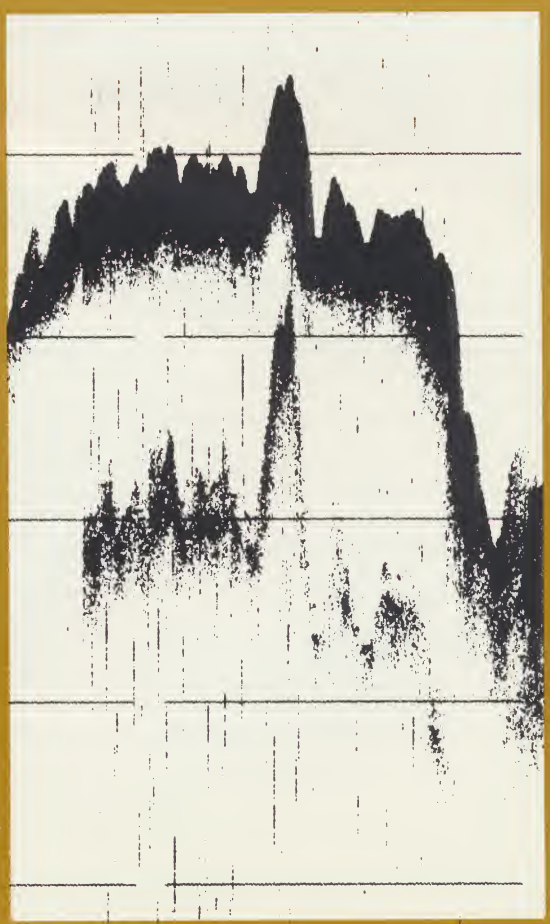
PRODUCT DATA

MODEL PFR-193C

Meets rigid demand of shipboard environment

The Raytheon Precision Fathometer® Recorder, Model PFR-193C sets the standard for oceanographic survey and bathymetric data recording by meeting the rigid demands of the shipboard environment. Using MIL-E-16400 as a design guide, the recorder is engineered and manufactured to provide reliable operation for display of input signals with unequaled position accuracy, resolution and dynamic range from white to black with full gray scale range.

- **DRY ELECTROSENSITIVE PAPER**
  - High dimensional stability
- **PAST RECORD REVIEW**
  - No interruption of operation
- **MODULAR CONSTRUCTION**
  - Mechanical and electrical accessibility, simplified maintenance
- **PERIODIC BASE LINE CHECK**
  - Automatic depth orientation
- **VERSATILITY OF MOUNTING**
  - Table, shelf or bulkhead



PRECISION FATHOMETER® RECORDER PFR-193C

CHART DISPLAY

Dry electrosensitive paper in roll form 19⅛ inches wide by 350 feet long. Active scan length is 18.85 inches. Maximum display area is 19⅛ inches wide by 18 inches high. Recording density is 150 lines per inch ±2% at all speeds. Paper advance is 96 inches per hour on 100 fathom scale, 24 inches per hour on 400 fathom scale and 2.4 inches per hour on the 4000 fathom scale. Chart reading accuracy is 0.05% on all scales. Recording ranges from near white to full black with full intermediate gray scale.

DEPTH SCALES

100 fathoms, ¼ second per scan
400 fathoms, 1 second per scan
4000 fathoms, 10 seconds per scan
Depth scales are switch selectable at primary control panel.

BASE LINE CHECK

Automatic changeover from 400 fathom scale to 4000 fathom scale for base line check at switch selectable time intervals of 15, 30 or 60 minutes.

CALIBRATION LINES

100 fathom scale – 21 lines, 5 fathoms per division.
400 fathom scale – 21 lines, 20 fathoms per division.
4000 fathom scale – 21 lines, 200 fathoms per division.
Calibration lines are interrupted for approximately 10 seconds every 5 minutes.
Line positioning is screwdriver adjustable.

SWEEP AND FREQUENCY STANDARDS

Continuous scanning utilizes three equally spaced styli mounted on a fiberglass reinforced neoprene timing belt. The time base accuracy determined by the self-contained frequency standard is 2 parts per million over the operating temperature range of the equipment; 1 part per million over the temperature range of ±5° C (±9°F) per week. A precision 5 watt 110 vac 60 hertz power source is incorporated to drive or time associated accessories or equipment such as a chronometer.

KEYING FACILITIES

Variable length keying is from 0.2 to 20 milliseconds in two ranges. Single ping operation is provided by operation of the key "off-on" switch. A 30 millisecond or longer key contact closure is provided on the 4000 fathom scale. Floating key contacts are capable of handling a maximum of ±200 volts at 0.2 amps. Center or edge (zero) key is switch selectable.

INPUT SIGNAL DATA

Input impedance . . . 5000 ohms

Freq. Response . . .	DC–200 kHz±2 dB *	
Black Ref. Level	±1 Volt DC	0.5 Volt RMS

* In two steps: DC - 20 kHz and 2-200 kHz

PRIMARY OPERATION CONTROLS

1. Depth scale selector – Allows selection of any of 3 scales. Selects automatic changeover to the 4000 fathom scale for base line check at intervals of 15, 30 or 60 minutes. (The base line check is interlocked with the grid-line interruption and can be phased to any external time standard).
2. Gain control – For setting black level
3. Gating range – Allows recording only the bottom returns. Fixed, selectable increments of 400 fathoms to preset depth. Transceiver outgoing pulse recorded continuously. Error in depth setting proportional to loss of data.

PRIMARY OPERATION CONTROLS (CONT.)

4. Gating – On/Off
5. Key – Off, X1, X10
6. Key pulse length
7. Event Mark (Remote activation provided).
8. Headphone Jack
9. Grid Mark and deep scale phase controls
10. Power Switch – On/Off
11. Operate-Standby switch

SECONDARY CONTROLS*

1. Contrast control. Permits varying the dynamic range of the PFR to compensate for varying signal-to-noise ratios.
2. Threshold control. Permits elimination of unwanted background noise. Automatic limiting is also provided to prevent excessive black levels or signal peaks.
3. Rapid chart advance. (Automatic and manual provided).
4. Sweep phase control. Allows phasing of sweep to external time base.
5. Center-Edge Key pulse switch. Allows rapid shifting of record by half of frame.
6. Illumination control. Permits brightness level set for chart illumination.
7. Paper Take-Up Tension control. Allows past record review while in operation.

*(Located under equipment cover to prevent accidental activation)

TEST FACILITIES

Voltmeter with selector switch permits checking the major operating functions.

POWER REQUIREMENTS

95 to 130 vac, single phase, 57 to 63 Hz, power consumption less than 300 watts (6 indicator fuses provide AC protection)

SIZE AND WEIGHT

Width – 34½ inches, Height – 11¾ inches,
Depth – 28 inches. Weight – 180 pounds
Shipping Weight – 245 pounds (approximate).

WORKMANSHIP

Best commercial/industrial practices for marine equipment.

AVAILABLE OPTIONS

A. Paper Feed Gear Sets – matched gear sets may be used for individual selection of 150, 123, 99, 81, 60, 49, 46, 40 and 36 lines per inch ±2%.
B. Double Speed Paper Feed Gear Sets – matched gears may be installed to provide Option A with a selection of 75, 62, 50, 41, 30, 24, 20 or 18 lines per inch ±2%.
C. Chart Feed Clutch – a switch controlled clutch mechanism and gears may be installed to provide for the selection of any two writing densities. See options A and/or B.
D. Left/Right Scan – a reverse scan mechanism may be installed to provide a left to right scan. The paper advance remains top to bottom.
E. Elapsed Time Meter – a meter may be mounted under the primary control panel to show operating time up to 9999.9 hours.
F. Seismic Preamplifier – an amplifier and selector switch may be installed to provide frequency response of DC to 5 kHz with a sensitivity of ±.05 V to 1.0 VDC in 10 dB steps.
G. Metric Calibration – a calibration drum and scale may be supplied to provide for measurement in meters rather than fathoms.

Raytheon Company reserves the right to make changes to specifications and any other data without notice.

RAYTHEON COMPANY
SUBMARINE SIGNAL DIVISION
RAYTHEON

OSE-104C

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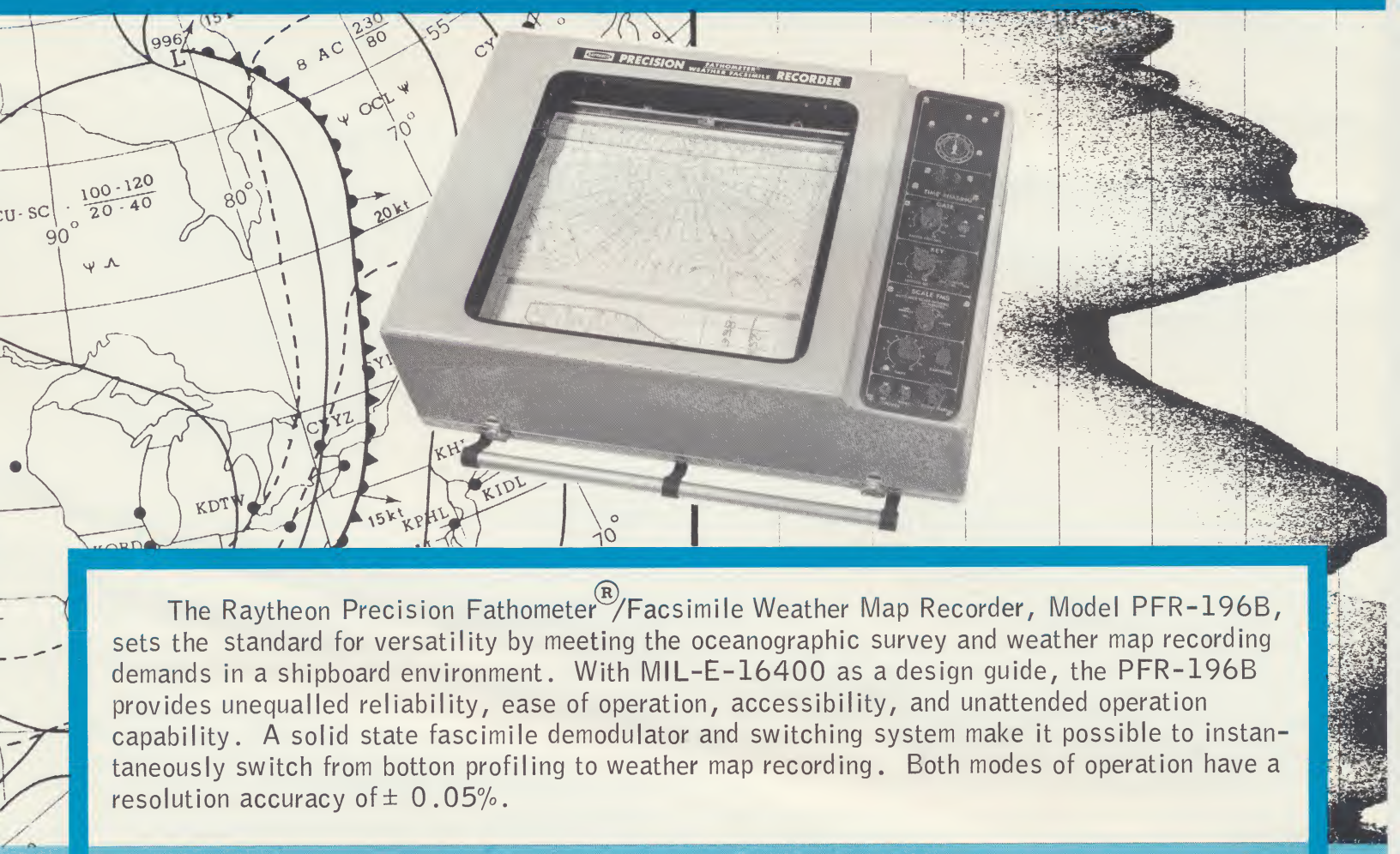
RAYTHEON

PRECISION FATHOMETER® / WEATHER FACSIMILE RECORDER

PRODUCT DATA

Model PFR – 196B



The Raytheon Precision Fathometer®/Facsimile Weather Map Recorder, Model PFR-196B, sets the standard for versatility by meeting the oceanographic survey and weather map recording demands in a shipboard environment. With MIL-E-16400 as a design guide, the PFR-196B provides unequalled reliability, ease of operation, accessibility, and unattended operation capability. A solid state fascimile demodulator and switching system make it possible to instantaneously switch from botton profiling to weather map recording. Both modes of operation have a resolution accuracy of ± 0.05%.

WEATHER MAP AND DEPTH RECORDING

Switch Selector

Self-contained Facsimile Demodulator

DRY ELECTROSENSITIVE PAPER

High dimensional stability

VERSATILE SIGNAL PROCESSING

Controllable for optimum contrast, gain and threshold with high dynamic range and high resolution

PAST RECORD REVIEW

No interruption of operation

Automatic or manual rewind of past record after review

PRINT AMPLIFIER

Maximum stability and repeatability

MODULAR CONSTRUCTION

Mechanical and electrical accessibility, simplified maintenance

Minimum of controls simplifies operation

VERSATILITY OF MOUNTING

Table, shelf or bulkhead

RUGGED CONSTRUCTION

Reliable operation at sea

PRECISION FATHOMETER®/FACSIMILE WEATHER MAP RECORDER SPECIFICATIONS

CHART DISPLAY AND SCALE SELECTION

Dry electrosensitive paper in roll form 19-1/8 inches wide by 350 feet long. Active scan length is 18.85 inches. Chart display area is 19-1/8 inches wide by 18 inches deep. Recording density is 150 lines per inch for bottom profiling and 96 lines per inch for weather map facsimile, ± 2% at all speeds.

Scale (Switchable)	Paper Advance (Inches Per Hour)	Seconds Per Scan
100 Fathoms	96	1/4
200 Fathoms	48	1/2
400 Fathoms	24	1
800 Fathoms	12	2
2000 Fathoms	4.8	5
4000 Fathoms	2.4	10
Weather - 60 rpm	37.5	1
Weather - 120 rpm	75.0	1/2

Chart reading accuracy is 0.05% on all scales. Recording ranges from near white to full black with intermediate grey scale on bottom profiling. Full black to white contrast in weather map mode with noise suppression.

BASE LINE CHECK

Automatic changeover from 400 fathom scale to 4000 fathom scale for base line check at switch selectable time intervals of 15, 30, or 60 minutes. The base line check is interlocked with the grid line interrupt and may be phased to any external time standard.

SWEEP AND FREQUENCY STANDARDS

Continuous scanning utilizes three equally spaced styli mounted on a fiberglass reinforced neoprene timing belt. The time base accuracy on all depth scales as determined by the self-contained frequency standard is two parts per million over the operating temperature range of the equipment; one part per million over the temperature range of ± 5 C(± 9 F) per week. Five watts of precision 110V AC 60 Hz power is available to drive time associated accessories or equipment, such as a chronometer.

KEYING FACILITIES

Variable length keying is from 0.2 to 20 milliseconds in two ranges. Single ping operation is provided by operation of the key "off-on" switch. A thirty millisecond or longer key contact closure is provided on the 2000 and 4000 fathom scales. Floating key contacts are capable of handling a maximum of ± 200V at 0.2 amps. Center or edge key is switch selectable.

PRIMARY OPERATING CONTROLS

1. Scale Selector
2. Base Line Check
3. Gain Control
4. Gating Range

PRIMARY OPERATING CONTROLS (CONT.)

5. Gating - On/Off
6. Key - Off, X1, X10
7. Key Pulse Length
8. Event Mark
9. Grid Mark and Deep Scale Phase Controls
10. Headphone Jack
11. Power Switch - On/Off
12. Operate/Standby Switch
13. Fathometer®/Facsimile Switch

PRINT AMPLIFIER

White to black dynamic range is variable from +10 to -40 dB referred to the input. Amplifier stability and repeatability are maximized by the use of integrated circuits.

SECONDARY CONTROLS

1. Contrast Control
2. Threshold Control
3. Rapid Chart Advance
4. Center-Edge Key Pulse Switch
5. Illumination Control
6. Paper Take-Up Tension Control
7. Sync Phase Pushbutton
8. Transceiver Selector
9. Print Response Selector
10. Sync Source Selector

TEST FACILITIES

Voltmeter with selector switch permits checking major operating functions. Test points accessible on each P/C card.

POWER REQUIREMENTS

95 to 130V AC, single phase 57 to 63 Hz, power consumption less than 320 watts (6 indicator fuses provide AC protection).

SIZE AND WEIGHT

Width - 35-1/4 inches.
Height - 12-7/16 inches.
Depth - 29-1/4 inches
Weight - 180 pounds; shipping weight - 245 pounds (approx.).

WORKMANSHIP

Best commercial/industrial practices for marine equipment.

APPLICABLE MIL SPECIFICATIONS

Environmental requirements for Class 4 equipment of MIL-E-16400, MIL-STD-167 (Vibration) and MIL-S-901C (Shock) used as design and fabrication guide.

AVAILABLE ACCESSORIES

Elapsed Time Meter
Self-contained Remote Tuning Indicator for facsimile receiver tuning.

FATHOMETER®

CALIBRATION LINES

100 fathom scale--21 lines, 5 fathoms per division
200 fathom scale--21 lines, 10 fathoms per division
400 fathom scale--21 lines, 20 fathoms per division
800 fathom scale--21 lines, 40 fathoms per division
2000 fathom scale--21 lines, 100 fathoms per division
4000 fathom scale--21 lines, 200 fathoms per division

Calibration lines are interrupted for approximately ten seconds every five minutes. Line positioning is internally adjustable while recorder is in operation. Calibration lines are not printed in the weather map mode.

INPUT SIGNAL DATA

Fathometer®

Input Impedance - 5000 ohms
Frequency Response - DC to 20 kHz and 1 kHz to 200 kHz ± 1 dB
Black Reference Level - 0.5V rms or ± .5V DC

FACSIMILE

WEATHER MAP FACSIMILE DEMODULATOR

Built-in preamplifier and demodulator allows the auxiliary radio equipment to be remotely located. The facsimile weather map demodulator is designed for reception from Class 1 radio facsimile services. Resolution capability is less than 1 cycle at 1500 Hz. The index of cooperation is 576. (Requires appropriate off-air receiver, such as National HRO-500, Collins 51J1 or equivalent.)

INPUT SIGNAL DATA

Weather Map Facsimile

Input Impedance - 600 ohms balanced
Frequency Response Bandwidth - 1 kHz to 3 kHz
Black Reference - 1.5 ± .1 kHz
White Reference - 2.3 ± .1 kHz
Signal Level - +10 to -40 dbm (8 millivolts to 2.5 volts)

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RAYTHEON COMPANY
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OSE-105A 5/68

RAYTHEON

PRECISION SEISMIC RECORDER

Model PSR-1910B

PRODUCT DATA

DISPLAY SEISMIC DATA

- VISIBLE REAL TIME VIEWING
- VARIABLE DENSITY DISPLAY
- START-STOP OR CONTINUOUS MODES
- ACCURACY AND RELIABILITY

The Model PSR-1910B Precision Seismic Recorder is a self-contained electromechanical unit designed to record in a periodic (continuous) or aperiodic (start/stop) mode. It provides a dry paper stratigraphic recording with a high degree of accuracy, stability and repeatability. The recordings may be produced from real time or computer processed digital or analog signals when the appropriate input power, motor drive and input signals are supplied.

The paper is dry electrosensitive in roll form 19-1/8 inches wide by 350 feet long. Active scan length is 18.85 inches. The display area is 19-1/8 inches wide by 18 inches high recording ranges from near white to black with a full intermediate grey scale. Paper dynamic range is 23 dB from white to black. Scan direction is from left to right, paper advance is from top to bottom.

PSR-1910B Specifications ....

SCAN SPEEDS

¼ second per scan	3 seconds per scan	8 seconds per scan
½ second per scan	4 seconds per scan	10 seconds per scan
1 second per scan	5 seconds per scan	
2 seconds per scan	6 seconds per scan	

Continuous mode on ¼ second through 10 second scans. Start/stop mode on 1 second through 10 second scans.

PRINT DENSITY

The writing density is 81 lines per inch. Writing densities may be selected by a change of gears to print from 18 to 150 lines per inch. See Option A (Gear Sets), Option B (Print Density Selector), and Option E (Double Speed Chart Feed Gear Sets).

INPUT SIGNAL FREQUENCY RESPONSE

The frequency response of the signal amplifiers is switch selectable from DC to 5 kHz ±1db or DC to 20 kHz ±1db, ; kHz - 200 kHz ±1 db.

INPUT SIGNAL DATA

DC - 5 kHz (Seismic) ± .05V to ±1V DC = Black 5K ohms unbalanced	DC - 20 kHz (Normal) 0.5V rms = Black 5K ohms unbalanced
1 kHz - 200 kHz (Normal) 0.5V rms = Black 5K ohms unbalanced	Start/Stop Trigger >2V peak; <2 MS risetime AC or DC 10K ohms unbalanced

The trigger input will accept a signal amplitude up to 100 volts peak to peak swing. The print amplifier channel is disabled during the stop interval in the start/stop mode.

FREQUENCY STANDARDS

The time base accuracy determined by the self-contained frequency standard is ±1 part per 20,000 over the operating temperature range of the equipment.

OUTPUT SIGNALS

1. 0 pulse (continous scan only) - 20 microsecond wide pulse at beginning of scan.
2. Scan level (start/stop only) - Positive level indicates when recorder is scanning.
3. 2400 Hz for magnetic tape sync recording.

All pulses have the following characteristics: (T^2L Components)

"1" level ≥2.4 volts @ + 0.4 ma
"0" level ≤ 0.4 volts @ - 16 ma

No load rise and fall time are <0.2 microsecond.

Rise and fall time approximately 1 microsecond with 2200 mmf capacitive load.

EXTERNAL SYNC DRIVE

The recorder may be driven by an external time base. The frequency is 2400 Hz with an amplitude of 15V pp minimum sine wave or a 3V pp minimum square wave. The polarity to be 0 to positive level or AC coupled.

SWEEP STANDARDS

The continous or start/stop mode of scanning utilizes three equally spaced styli mounted on a fiberglass reinforced neoprene timing belt. In the continuous mode of operation the chart reading accuracy is 0.05% on all scales. In the start/stop mode the acceleration time is 15 to 30 milliseconds. The acceleration time tolerance is ±2 milliseconds.

TEST FACILITIES

Built-in voltmeter with selector switch permits checking major operating functions. Test points accessible on each P/C card.

POWER REQUIREMENTS

95 to 135V AC, single phase 57 to 63 Hz, power consumption 320 watts (6 indicator fuses provide AC protection).

GRID MARKS

Front panel controls select the constant time marks (100 ms + 1 second or 1 second only) or the constant number of marks (20) per scan. A mark intensity control adjusts the grid mark density from off to full black. The 1 second marks are written at a distinctly darker shade than the 100 ms marks. The count start of the constant time marks is synchronized with the start of scan. Positioning of the constant number marks is internally adjustable while recorder is in operation.

FRONT PANEL CONTROLS

1. Scale Selector - selects one of ten scan speeds.
2. Grid Marks Switch - selects constant time, 100 ms + 1 second, 1 second only, or constant number (20).
3. Grid Mark Intensity - controls grid writing density from off to full black.
4. Trigger Level - controls gain of trigger circuit.
5. Trigger Slope - selects input for either a positive or negative going trigger pulse with AC or DC coupling to trigger circuit.
6. Mode - continuous or start/stop.
7. Gain - sets black level.
8. Amplifier Response Selector Switch - selects amplifier in use (normal) DC - 20/1 - 200 kHz, (seismic) DC - 5kHz, and +, -, full wave on seismic.
9. Event Mark Switch - push to mark (remote activation provided)
10. Power Switch - On/Off
11. Operate/Standby Switch

INTERNAL PANEL CONTROLS*

1. Contrast Control - permits varying the dynamic range of the PSR to compensate for varying signal-to-noise ratios.
2. Threshold Control - permits elimination of unwanted background noise. Automatic limiting is also provided to prevent excessive black levels or signal peaks.
3. Gray Level Control - permits changing of background gray level with no input signal for variable area type recordings (only on seismic + or - position).
4. Rapid Chart Advance - (automatic and manual provided).
5. Illumination Control - permits brightness level set for chart illumination.
6. Paper Take-Up Tension Control - allows past record review while in operation.
7. Sweep Phase Control - allows phasing of sweep to external time base in continuous mode.

(*Located under equipment cover to prevent accidental activation.)

ENVIRONMENTAL

Temperature - 0° to 50°C (32° to 122°F)
Humidity - 95% (excluding paper)

SIZE AND WEIGHT

Width - 35¼ inches	Depth - 29¼ inches
Height - 15 inches	Weight - 180 pounds

INSTRUCTION MANUAL

Two instruction manuals are supplied with each recorder. The manuals include sections on installation, operation, maintenance, theory and circuit analysis with complete schematics, parts lists, and exploded mechanical assembly drawings.

OPTIONS

A. Chart Feed Gear Sets - matched gear sets may be installed for individual selection of 150, 123, 99, 61, 49, 46, 40, and 36 lines per inch ±2%.
B. Chart Feed Clutch - a switch-controlled clutch mechanism and gears may be installed at the time of assembly to provide for the selection of any two print densities.
C. Elapsed Time Meter - a meter may be mounted under the primary control panel to show operating time up to 9999.9 hours.
D. Wide Writing Stylus on special request.
E. Double Speed Chart Feed Gear Sets - matched gears may be installed to provide Option A with a selection of 75, 62, 50, 41, 30, 24, 20, 18 lines per inch, ±2%.

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